Zihan Liang

zihan.liang@emory.edu (404)310-6818 Personal Website zihan-liang zihanliang

Education

Emory University *Honors BS in Applied Mathematics and Statistics; AI Minor* *Aug 2023 – May 2026*

- **GPA:** 3.98/4.00
- **Awards and Honors:** Dean's List; ASA DataFest Best Visualization Award; AIMO Bronze Medal
- **Coursework:**
  - Mathematics: Multivariable Calculus, Linear Algebra, Discrete Mathematics, Ordinary Differential Equations, Graph Theory (Graduate Level), Real Analysis (UIUC NetMath)
  - Statistics & Computation: Mathematical Statistics, Numerical Analysis, Data Science Computing, Machine Learning, Text Data Science, Experimental Methods, Causal Inference (Doctoral Level)
  - Biostatistics & Bioinformatics: Systems Biology and Biotechnology Specialization

Publications

MambaDATG: Domain-Adaptive Tri-Plane-Gated Pre-training for 3D Abdominal Segmentation ICASSP 2026 *Mar. 2025 – Jan. 2026*

Y. Shen*, D. Jiang*, *Zihan Liang**, Y. Wei, W. Yang, S. Wang, et al.

- Proposed MambaDATG, a tri-plane-gated selective SSM pre-training that fuses axial, coronal, and sagittal scans via voxel gating—capturing directional anisotropy with linear-time efficiency and zero inference overhead
- Introduced a domain-adaptive MIM stage adapting high-level layers on unlabeled CTs, improving small-organ segmentation (e.g., +1.8 Dice on BTCV) and revealing the tri-plane gate as the key performance driver

Causal Representation Learning from Multimodal Clinical Records under Non-Random Modality Missingness EMNLP 2025 Main *Feb. 2025 – May 2025*

*Zihan Liang**, Ziwen Pan*, Ruoxuan Xiong

- Proposed CRL-MMNAR, a causal multimodal framework that treats modality missing-not-at-random as signal—combining missingness-aware fusion (gated by observation patterns) with cross-modal reconstruction + contrastive learning, and a multitask predictor with a cross-fitted rectifier to correct observation-pattern bias
- Demonstrated consistent gains on MIMIC-IV and eICU, including AUC 0.8687→0.9693 for ICU admission (+11.6%) and 0.7989→0.8657 for readmission (+8.4%) on MIMIC-IV, and readmission AUC improving to 0.9294 (+13.8%) on eICU, with lower Brier scores indicating better calibration

CareLab at #SMM4H-HeaRD 2025: Insomnia Detection and Food Safety Event Extraction with Domain-Aware Transformers AAAI ICWSM 2025 *Feb. 2025 – Apr. 2025*

*Zihan Liang**, Ziwen Pan*, Sumon Kanti Dey, Azra Ismail

- Ranked 1st on SMM4H–HeaRD 2025 Task 5, developing a RoBERTa + GPT-4–augmented system with class-weighted training and ensembling, achieving F1 = 0.958 and revealing the limits of rule-based span extraction in clinical and food-safety texts

Dynamic Policy Design for Autonomous Taxi Adoption: A Hierarchical Game-Theoretic Framework TRB Annual Meeting *Jun 2024 – Dec. 2025*

Zihan Liang, Ziwen Pan

- Formulated a three-tier dynamic Stackelberg game modeling interactions among government, platform, and workers in autonomous taxi adoption, deriving equilibrium policies that balance innovation incentives with social welfare

Manuscripts

Learning Dynamic Representations and Policies from Multimodal Clinical Time-Series with Informative Missingness ACL 2026 Under Review *Oct. 2025 – Present*

*Zihan Liang**, Ziwen Pan*, Ruoxuan Xiong

- Developed an MNAR-aware multimodal state encoder for offline clinical RL by extending GRU-D with explicit missingness features (time gaps, cumulative counts, missing rates, windowed frequencies) and fusing step-

sparse clinical text via cross-attention + adaptive gating, with reconstruction to preserve missingness signals

- Designed an action-conditioned latent belief dynamics (VAE) module (with a multi-step credit assignment guarantee) and integrated it with Implicit Q-Learning for sepsis treatment optimization, achieving AUROC 0.876 and +20.3% policy improvement over clinician behavior (largest gains in high-severity strata)

Behavioral Deviation as Deliberative Signal: Hierarchical State Decomposition for Sequential Multimodal Recommendation ACL 2026 Under Review *Oct. 2025 – Present*
Ziwen Pan*, *Zihan Liang**, Ruoxuan Xiong

- Developed HSD-SMR, a hierarchical debiasing layer that corrects sequential recommender states via group-stratified temporal statistics plus a deviation-vector–driven, reliability-gated individual update
- Engineered a 16-D behavioral deviation feature set and multi-task training (BPR ranking + rating/modality/content auxiliaries) on a causal Transformer encoder, achieving 3–7% gains over SOTA across three Amazon categories

DART: Mitigating Harm Drift in Difference-Aware LLMs via Distill-Audit-Repair Training ACL 2026 Under Review *Oct. 2025 – Present*
Ziwen Pan*, *Zihan Liang**, Jad Kabbara, Ali Emami

- Proposed DART for difference-awareness classification, combining label-conditioned teacher rationale distillation, LoRA-based fine-tuning, and a structured inference-time explanation policy to control rationale content
- Built a harm-drift detection + targeted repair loop using paired baseline vs. distilled generations, toxicity-delta screening ($\tau = 0.01$) and LLM-as-judge severity stratification, then severity-weighted repair, improving Llama-3-8B accuracy 39.0%→68.8% while reducing drift cases 435→119 (−72.6%)

Adaptive Spatiotemporal Graph Neural Networks with Trend-Aware Prediction and Validation-Gated Calibration for Traffic Flow Forecasting IEEE T-ITS Under Review *May 2025 – Present*
*Zihan Liang**, Ziwen Pan*, Shuyang Yu

- Proposed an adaptive spatiotemporal GNN that fuses distance- and correlation-based graphs with dual temporal–spatial encoders and a trend-aware head, achieving state-of-the-art accuracy on PeMS benchmarks
- Designed a validation-gated calibration pipeline with hour-conditional quantile mapping and AR(1) residual correction, applied only when improving MAPE/MAE to ensure reliable and interpretable post-processing

Gated Dynamic Local-Global Attention for Sentiment Analysis: Enhancing Context Awareness in Short Texts Appl. Intell. Under Review *Jun 2024 – Present*
Ziwen Pan*, *Zihan Liang**

- Developed a Gated Dynamic Local–Global Attention (GDLGA) architecture that combines BERT-based global context modeling with sentiment-adaptive dynamic local attention, enabling window sizes to expand or contract based on token-level emotional intensity
- Introduced a token-level gating mechanism and multi-granularity pooling to fuse hierarchical global features with fine-grained local representations, achieving more stable, calibrated, and context-aware sentiment classification in short texts

Collaborative Research Projects

Research Assistant and Software Developer *Atlanta, GA*
Collective Action & Research for Equity (CARE) Lab, Emory University *Sept 2024 – Present*

- Analyzed 1,000 user data points and built an interactive dashboard for MakerGhat using JavaScript, Python, and HTML, improving accessibility and visualization of organizational data
- Developed an offline-first Android app for classroom session recording and metadata management, integrating Google Sheets validation, offline caching, and secure Drive synchronization
- Maintained a WhatsApp EduBot (Python, Twilio) supporting 15,000+ teachers and 600,000+ students

Artificial Intelligence Research Intern *Remote*
Google China, Inc. *Jun 2025 – Aug 2025*

- Optimized traffic sign detection models (YOLOv8, YOLOX) on TT100K through hparam tuning, data augmentation, and knowledge distillation frameworks, improving mAP by +4% overall and boosting small-object detection by $> 15\%$, retaining real-time efficiency
- Executed cross-domain transfer learning (TT100K → GTSRB, LISA, CTSD, BelgiumTSC), achieving up to +44% mAP in few-shot settings and validating robust model generalization across diverse datasets

Research Assistant - ODE Modeling for C. difficile Transmission *Remote*
Polymath Jr REU Summer Program *Jun 2025 – Aug 2025*

- Developed and analyzed ODE-based models of C. difficile community transmission and simulated intervention strategies in MATLAB/R to evaluate outbreak control, with results submitted to the JMM 2026

Leadership Experience

Founder and President | *Emory Artificial Intelligence and Data Association* *Dec 2024 – Present*

- Founded and led EAIDA, growing it into a 200+ member AI community and launching the "AI for ALL" initiative to promote AI literacy through workshops, discussions, and mentorship

Additional Information

Technologies: Python (Proficient; PyTorch, TensorFlow, NumPy, Pandas, Scikit-learn), R (Proficient; statistical modeling, data visualization), LaTeX(Proficient), MATLAB (Intermediate; numerical analysis, signal processing), Java (Intermediate), JavaScript & HTML (Intermediate; data visualization & prototyping)